Development of a plutonium ceramic target for the MASHA separator

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We are currently working on the development of a solid Pu ceramic target for use in the MASHA (Mass Analyzer of Super Heavy Atoms) on-line mass separator in Dubna. Along with recent upgrades of the U400 Cyclotron, MASHA will provide for at least a ten-fold increase in the production and detection rate for element 114 atoms, and will allow us to measure their atomic weights precisely. The MASHA separator will employ a thick Pu ceramic target capable of tolerating temperatures in the range of 2000 °C without vaporizing the actinide target. Promising candidates for the Pu target include Pu carbides and nitrides, although more research into the thermodynamic properties of these compounds will be required. Reaction products will diffuse out of the target and will drift to an ECR ion source after which they will be transported through the separator and will impinge on a position-sensitive focal-plane detector array. Furthermore, operation of the MASHA hot target/ion source combination will provide chemical volatility information that will support our assignment of an atomic number of 114 to these nuclei. Taken together, we expect that experiments on MASHA will allow us to make measurements that will cement our identification of element 114 and provide for future experiments in which the chemical properties of the heaviest elements are studied.